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Agricultural Experiment Station

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UNIVERSITY OF KENTUCKY

FIFTY-FIFTH ANNUAL REPORT

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INSTITUTE

Report of the Director
for the year 1942

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LETTER OF TRANSMITTAL

To His Excellency, Hon. Keen Johnson, Governor of Kentucky:

Sir: In accordance with an act of Congress, approved March 2, 1887, entitled, "An act to establish Agricultural Experiment Stations, in connection with the Agricultural Colleges established in the several states under the provisions of an act approved July 2, 1862, and under the acts supplementary thereto," and of the act of the Legislature of the State of Kentucky, approved February 20, 1888, entitled, "An act to accept the provisions of an act passed by the Congress of the United States, approved March 2, 1887, for the establishment and maintenance of Agricultural Experiment Stations in connection with Agricultural Colleges established by the several states and territories under the act of Congress approved July 2, 1862," I herewith submit the fifty-fifth annual report of the Kentucky Agricultural Experiment Station.

Very respectfully,

THOMAS P. COOPER, Director.

ANNUAL REPORT
of the
DIRECTOR OF THE KENTUCKY AGRICULTURAL EXPERIMENT STATION
For the Year 1942

During the year covered by this report, the first full year since our entrance into the war, the projects conducted by the Experiment Station have been modified and developed to give the greatest possible consideration to research that would contribute to war needs. During this time a large number of well-trained members of the research staff have entered the armed forces. Most of these it has been impossible to replace with research workers of equal experience, and many of them could not be replaced at all. Materials used in experimental work have sometimes been difficult or impossible to obtain. Nevertheless, despite these difficulties of personnel and materials, the research of the Kentucky Experiment Station, as covered by publication of results, has been large and noteworthy.

Interest of farmers in the many problems of production, in control of livestock and plant diseases, and in many other matters that have become important in the attempt for maximum agricultural production, has led to numerous inquiries. The Experiment Station staff has given valuable assistance both to individuals and to groups in furnishing specialized information bearing on agriculture in war.

SOILS AND CROPS

Field work in soil management.— Productive soils are of utmost importance to the nation at war, for then it is necessary to produce maximum crop yields with the minimum use of labor and land available for harvest crops. For more than 30 years the Experiment Station has maintained experiment fields, in sections of the state representative of the more important soil areas, to study methods of soil improvement and as demonstrations to Kentucky farmers. In general, all the soils outside the Bluegrass area, unless they receive special treatment are lacking in phosphorus and nitrogen, and are too acid for successful growing of the better soil-improving legumes. These experiments have shown that by liming these soils and the regular use of phosphate fertilizers in a good cropping system, including the proper use of legumes, sufficient nitrogen may be derived from the legumes to improve crop yields greatly if crop residues and manure are properly conserved and used.

The very great increase in the use of lime and phosphate by Kentucky farmers in recent years shows that they are now aware of the need of these materials for improving crop yields. In the past 10 years about 8 million tons of limestone or its equivalent have been used, enough to have limed 1 acre in every 4 acres of crop and plowable pasture land in the state at the rate of 2 tons per acre. In the past 3 years, it is estimated that enough phosphates have been used to provide the equivalent of 300 pounds per acre of 20-percent superphosphate on 40 percent of all the crop and plowable pasture land of Kentucky.

Value of manure in a general cropping system.— The value of manure in the management of soils is shown by 30 years' tests at Mayfield. Two sets of four plots each, to accommodate the four crops in the rotation, were limed heavily in the early years of the experiment and have received ample superphosphate regularly in each rotation. On one set of plots, stable manure has been returned regularly for the corn in the rotation for the last 27 years except one year, while on the other set no manure was applied and no crop residues returned except during three years at the beginning of the experiment. In the first few years, crop yields were greatly improved on both sets of plots by the lime and phosphate treatment and the growing of legumes, but in succeeding years the yields gradually increased on the manured set and declined on the unmanured plots. With corn valued at 50 cents a bushel, wheat at 75 cents, and hay at $10.00 a ton, the crop increases from manuring gave a value of $2.00 for each ton of manure applied. The manure generally was applied at a rate equal to the weight of crops removed, wheat grain excepted.

Value and lasting effect of limestone in crop production.— The great value of limestone for increasing productivity of soils which are in serious need of lime is shown by 30 years' tests at Mayfield on two sets of plots. Both sets received the same superphosphate treatment and a return of manure based on the crop yields, but one set of plots was limed between 1913 and 1920 at the average rate of 4½ tons per acre of coarse limestone (¼ inch to dust). The other set has never been limed. With corn valued at 50 cents a bushel, wheat at 75 cents a bushel, and hay at $10.00 a ton, the value of the crop increases from liming has been about $39.50 for each ton of limestone used. From reliming tests made recently, it is evident that enough limestone still remains in the soil and that there is no need of reliming.

Residual effect of superphosphate and rock phosphate.— Productive soils which have been built up during a considerable period through regular use of phosphate fertilizers (especially rock phosphate) and other good soil management practices, will continue to produce good crop yields even if it becomes necessary to curtail the use of phosphate fertilizers. This is shown by tests during the past 12 years at three of the experiment fields, where certain plots previously treated with superphosphate and rock phosphate were divided and the use of these materials discontinued on one half of each plot and continued on the other half. Where superphosphate was discontinued the average yields during the past four years have been lower than where it was continued, by the following percentages: corn, 7 percent; wheat, 25 percent; first-year hay, 16 percent; second-year hay, 16 percent. On the other hand where rock phosphate was discontinued the yields have remained practically as high as where it was continued.

Phosphorus in soils of the Inner Bluegrass region.— Considerable variation in total phosphorus in the Inner Bluegrass soils has been known to exist, but it has been thought to be associated chiefly with soil type and distinct areas. During the past year the availability of phosphorus in soils of this region was studied on a larger scale by determining acid-soluble phosphorus in a number of soil samples of known phosphorus content. According to results from about 75 samples, in soils ranging from 1,000 to 18,000 pounds total phosphorus per acre in the first 6 or 7 inches, the phosphorus soluble in $0.05N H_2SO_4$ ranged from 20 to 12,000 pounds per acre. The amount of soluble phosphorus was not entirely proportional to the total amount of phosphorus present. Most of the soils in the higher group belonged to the Maury series, but some were from the Mercer and Salvisa series. Similarly, while most of the soils in the lower group belonged to the Mercer, Loradale, Salvisa, and Huntington series, some mapped as Maury also were in this group. In one group of samples taken at locations on a line about 30 rods long in a field in the Maury area, differences ranging from 3,800 to 7,500 pounds of total phosphorus per acre were found, with 400 to 3,700 pounds per acre of this amount in acid-soluble form.

Leaching of nitrogen under Korean lespedeza.— In 1940 new lysimeters were constructed at the Station farm, in which leaching conditions closely resembles field conditions. In some of these lysimeters the soil columns are 4 feet deep, the soil was not disturbed in their construction, and the lysimeter wall extends not quite to the

soil surface. Korean lespedeza has been grown continuously in these and the entire growth left on. The nitrogen leached in these lysimeters from October 1, 1940, to December 1, 1942, was 88.7 pounds per acre.

Response of alfalfa to boron.— In cooperation with county agricultural agents, tests of response of alfalfa to applications of borax were made in some 50 fields, on several types of soil. Borax was applied at the rate of 20 pounds per acre. In many of the tests, there were treatments of borax alone, potash alone, and borax and potash combined. Slight to considerable increase in growth and vigor of the plants was reported in 18 of these tests. On the basis of present information, need for borom by alfalfa, indicated chiefly by the condition known as "alfalfa yellows," may occur on any of the soils in the state, and probably such need is more closely related to heavy past liming and cropping than to soil type. Chemical analyses of alfalfa plants where boron was added showed that they contained more than twice as much boron as plants grown on soil to which no boron was added.

Distribution of boron in the soil.— Determinations of water-soluble boron in 330 samples from over the state showed a range from 0.1 ppm to 5.7 ppm with an average of 0.6 ppm. Total boron, determined in 24 samples of soil from different parts of the state, ranged from 23 ppm to 66 ppm. The soil which contained the smallest amount of water-soluble boron presumably is deficient therein for best growth of crops.

Pasture fertilizing.— Two pasture fertilization experiments, in cooperation with the Tennessee Valley Authority, were begun in 1940 to determine the relative effectiveness, for pasture production, of phosphate worked into the soil before seeding or broadcast after seeding and at intervals thereafter. One set of plots is near Mayfield, on Grenada silt loam; the other is on another silt loam, probably Tilsit, near Greenville.

Four cuttings were harvested from three caged areas on each plot in 1942. The average yields on plots treated with limestone, potash, and 20-percent superphosphate worked into the soil before seeding were 3,271 pounds of dry matter at Greenville and 3,516 pounds at Mayfield. Plots similarly treated except that the phosphate was applied to the surface produced 3,600 and 4,037 pounds, respectively. Yields on plots treated with raw and fused rock phosphates were intermediate between those on the untreated plots and the limed and fertilized plots. Average yields from the untreated plots were 2,030

pounds of dry matter at Greenville and 2,141 pounds at Mayfield. The weed content of the herbage in both pastures was highest on the untreated plots, and next highest on plots treated with rock phosphate.

Heavy fertilization vs. manure and phosphate for burley tobacco.— In a test at Greenville on the same land in 1940 and 1941, superphosphate, potash, and nitrate of soda equivalent to 1,000 pounds per acre of an 8-10-10 fertilizer were applied for tobacco each year on half of a plot which had received lime and phosphate several years previously. On the other half of the same plot, manure at the rate of 15 tons per acre and 500 pounds of superphosphate were applied each year. As an average of the two crops, heavy application of commercial fertilizer produced 1,537 pounds of burley tobacco valued at $354 per acre, whereas the heavy manuring and phosphate fertilization produced less tobacco—1,375 pounds—but of better quality, valued at $369 per acre.

Level of available nitrogen for burley tobacco.— Results this year on the Station farm emphasize again the importance of having a large supply of available nitrogen in the soil for obtaining good yield and quality of burley tobacco. The wastage of lower leaves, reducing both yield and quality, was very great on plots with a low nitrogen supply but was much less where plenty of available nitrogen was in the soil. In these experiments, when the supply of mineral nutrients was adequate, quality of burley tobacco improved with increasing yield until large yields were obtained.

Response of burley tobacco to fertilizer potassium.— For the first three years of the test, begun in 1935, tobacco did not respond to the potash applications in either yield or quality even though the plots were cropped exhaustively. But since 1938 both yield and quality have been improved materially by 50 pounds per acre of sulfate of potash, still more by 100 pounds per acre. Two hundred pounds per acre, however, gave no advantages over 100 pounds.

Sources of tobacco leafspot organisms.— In artificially inoculated soil and in naturally infested field soil *B. angulatum* was isolated throughout the winter to April 21, but was not isolated in May. Where cover crops were growing in artificially inoculated soil, more bacteria were isolated than from fallow soil. Roots of wheat, crimson clover, and vetch, grown outdoors in artificially contaminated soil, were found to carry the leafspot bacteria. Cover-crop roots (wheat, barley, and rye) collected in the spring of 1942 from fields in which tobacco was infected with angular leafspot and wild-

fire in 1941, produced heavy infection on tobacco leaves when the roots were washed, crushed in water, and poured over the undersurface of water-soaked leaves. Tests of tobacco-bed soils while the plants were small failed to give infection, but as the plants increased in size, *B. tabacum* was isolated from the roots of plants from 5 beds, *B. angulatum* from 19, and both organisms from one. Neither organism was isolated from the roots of plants from 22 beds. Both organisms were isolated from shepherd's-purse and quack grass; wildfire alone from knotweed, henbit, and quack grass; and angular leafspot from ragweed and miscellaneous grass and weed roots. Bacterial colonies were readily found on the roots of tobacco plants from beds and from fields affected by wildfire and angular leafspot. Heavy infection resulted on tobacco leaves by using a bit of root tissue, on which the colony was present, as inoculum. Wildfire and angular leafspot were repeatedly caused on inoculated leaves throughout the summer and fall in this way, indicating that in the field the roots of tobacco may be the source of inoculum for sudden outbreaks during wet periods.

Heavy infection of water-soaked tobacco leaves resulted from inoculated roots of wheat, oats, barley, rye, castor beans, soybeans, cowpeas, vetch, alfalfa, red clover, crimson clover, plantago, oxalis, and tobacco. Preliminary tests indicate that the bacteria do not multiply rapidly, if at all, in association with roots of Kentucky bluegrass, Canada bluegrass, and redtop.

Mosaic and root-rot-resistant burley Ky. 52.— Developed by this Station during the past 4 years, Ky. 52 is the result of backcrossing mosaic-resistant (N) *Nicotiana digluta* burley hybrids with Ambalema type mosaic-resistant burley. It has been entirely free from mosaic the past three years, even though inoculated, and it makes rapid, vigorous growth in soil infested with the black-root-rot organism. It is a standup variety different from Ky. 16 primarily in being decidedly lighter green as it grows in the field. On the Station farm it has produced excellent tobacco and in limited tests with farmers it has been outstanding. It should be tried by farmers, especially those who have been troubled with mosaic.

Root-rot-resistant burley Ky. 41A.— This variety was developed at this Station about 7 years ago, but was not distributed widely in the state. It is a semi-standup type, rather dark as it grows in the field, but cures bright. In common with Ky. 16 it produces only a few comparatively small suckers, thus cutting the cost of production. In the variety test plot it has consistently given about equal yields

and equal or possibly slightly better quality than Ky. 16. Farmers who have grown it for several years are enthusiastic about it, claiming that it yields as well as Ky. 16 and outsells it on the market by one or two cents. It is a variety well worthy of trial by burley growers throughout the state. Commercial seed was available in 1942 and it is probable that certified seed will be available for 1944.

Value of N type of mosaic resistance in Ky. 48-7 burley.— The N type of mosaic resistance has been criticized because heavily inoculated plants sometimes develop systemic streak and die. Tests were made with N plants to determine the extent to which systemic necrosis might develop in the plant bed and how it would affect the plants when set in the field. One bed was heavily inoculated with the mosaic virus and another lightly about a week before pulling and setting. Leaf spotting occurred in both beds but no streak developed. During the first 3 weeks after setting, 12.6 and 5.2 percent, respectively, of the plants set from these beds died. Other plants were pulled with the hands contaminated with cured dark fire-cured tobacco from mosaic plants. All 91 plants set remained healthy. However, when healthy plants were pulled with hands contaminated with inoculum from freshly crushed mosaic leaves, only 4 of 94 plants set were alive 3 weeks after setting. It seems evident that the usual contamination on the hands of workers while weeding beds or pulling plants could have little or no effect on the stand of resistant plants obtained, and that handling even heavily necrotic spotted plants at pulling time does not contaminate the fingers sufficiently to have much effect on stand. In the mosaic breeding plot where all plants were inoculated with mosaic and were subject to reinfection throughout the summer, only 2 of several hundred N plants developed streak. In several years' work with N-resistant plants there has been no reason for believing that this type of resistance would not be a satisfactory means of controlling tobacco mosaic.

Vitamin B_1 in setting tobacco.— Three levels of application of vitamin B_1, covering the range which has been recommended, were compared with the use of water only. Five replications of the test were made, but no difference in growth or vigor was observed. Results were similar in 1941.

Tobacco curing experiments.— During the 1942 season, some of the tobacco was cut at what was believed to be the proper time, some 10 days before this, and some 10 days later. Each of the three lots was cured in three different ways: (1) at what previously had

been found to be optimum relative humidity (65 to 70 percent), (2) at a higher humidity (75 to 80 percent), and (3) at a lower humidity (50 to 60 percent). This experiment was made both with early-season and with late-season tobacco. In both crops the greatest damage resulted from the combination of too early cutting with too low relative humidity. This early cut tobacco dried quickly and remained greenish and mottled. The immature tobacco was less valuable, regardless of how cured, than the mature tobacco similarly cured. Overmature tobacco was somewhat less valuable than mature tobacco, but the difference was not nearly so great as between mature and immature. This confirms the opinion held by many tobacco men that more money is lost by cutting tobacco too soon than too late.

Hybrid corn tests.— Two new white hybrids, Ky. 203 [(Ky. 27 x Ky. 122) x (Ind. 33-16 x Ky. 49)] and Ky. 205 [(Ky. 122 x Ky. 58) x (Ind. 33-16 x Ky. 49)], were particularly outstanding in all the tests this year. At the Substation at Princeton and in the cooperative tests, Ky. 204 also was very outstanding. Ky. 203 was first in yield in the uniform cooperative tests in 1941, and ranked high in all the 1941 tests. Moisture was generally deficient in Kentucky in 1941, while in 1942 rainfall was ample in most of the state. This indicates excellent adaptation of Ky. 203 to varying seasonal conditions. The two hybrids have been added to the list of Kentucky hybrids for commercial production.

The superiority of adapted hybrid corn to open-pollinated varieties was strikingly shown in the tests this year at the Princeton Substation. The average yield of the twenty-one white hybrids in this test was 71 bushels an acre, as compared with 51.3 bushels for Pride of Saline, a white variety which in numerous tests in previous years proved to be the highest yielding open-pollinated variety grown in Kentucky.

Progress in producing new corn inbreds.— Of the many hundreds of corn inbreds isolated at the Kentucky Station, about half a dozen seem to possess considerable merit. One line, Ky. 35-35, from Jarvis, a yellow variety, apparently contributes high yield, very fine quality, and strong roots and stalks. It is believed it will prove better adapted for Kentucky conditions than some of the yellow inbreds now used in making Kentucky yellow hybrids. Another yellow, Ky. 36-18, from a double cross, contributes ear size to a remarkable degree and should be valuable in developing higher-yielding yellow hybrids. A white inbred from Pride of Saline is singularly free of faults frequently found in nearly all inbreds. From a local yellow

variety obtained in Tennessee have come two promising lines which are now being subjected to final tests. Among the older inbreds, Ky. 27, 49, 122, 58, and 21, all selfed 15 years or more, rank among the best white inbreds so far produced, as demonstrated by the record of yields of hybrids containing them.

Tests of winter oats.— On the Station farm this year, several varieties of winter oats were grown, including Fulwin (developed by the Tennessee Experiment Station from material furnished by the U. S. Department of Agriculture, and rather widely grown in Kentucky during the past few years) and Winter Turf, a variety that has been fairly dependable in southern-most Kentucky but not elsewhere in the state. Fulwin yielded at the rate of 105 bushels per acre, and Winter Turf 72.5 bushels per acre. Fulwin ripened about 10 days earlier than Turf and lodged very little, while Turf lodged very badly. Whether Fulwin is sufficiently winter hardy to be dependable except in the southern part of the state is as yet uncertain. It has not winterkilled to any extent since it has been grown in Kentucky, but neither has Turf, because of mild winters and snow protection.

Varieties of soybeans for oil extraction.— In tests to determine which of the rather numerous varieties of soybeans for oil extraction are best adapted to Kentucky, the varieties regarded as "medium early" in western Kentucky have been most satisfactory. They yield better than the earlier varieties and yet ripen early enough to permit combining during October. Nearly all the varieties tested are remarkably resistant to shattering. Of the varieties tested during the past three years, U. S. 70218-2, popularly known among growers as "U. S. dash 2" and in Indiana as Purdue No. 7, has given the highest yield. In addition, it is very resistant to lodging and shattering, and the oil content is high. Another U. S. Department of Agriculture selection, U. S. 54563-5 (known to growers as "U. S. dash 5"), Macoupin, and Scioto are nearly as desirable. Somewhat less desirable, according to average performance in our tests, are Illini, Dunfield, Mingo, and Ill. T119.

Castor beans.— Six varieties of castor beans were planted May 1 in a test in cooperation with the U. S. Department of Agriculture to determine good varieties for producing the castor oil needed for war purposes. Burs were harvested September 15, October 8, and November 4. Conner variety produced 1,742 pounds of threshed beans per acre; U. S. No. 4, 1,737 pounds; U. S. No. 7, 1,704 pounds; Kansas Common, 1,543 pounds; Kentucky 38, 1,535 pounds; and Doughty 11, 1,040 pounds. Because of its relatively low growth and large

clusters of burs, Kentucky 38 was easier to harvest than other varieties. No variety shattered seriously.

Alfalfa varieties.— Each of twenty-three varieties and lots of alfalfa seeded in the late summer of 1940 produced good yields of hay in 1942 from three cuttings. The lowest yield, 7,467 pounds of oven-dry material per acre, was from a Utah Common variety, and the highest, 9,482 pounds, from one lot of Kansas Common. The lowest yield from five lots of Kansas Common was 8,440 pounds. Commercial seed of Oklahoma Grimm and Oklahoma Common alfalfas produced 8,684 and 8,516 pounds, respectively. Hardigan, which has produced the best yields over a period of years in previous variety tests, yielded 8,923 pounds per acre in this test.

Alfalfa-grass mixtures for hay.— Alfalfa (Hardigan variety) sown alone produced 8,748 pounds of oven-dry material per acre from three cuttings of hay in 1942. Plots of alfalfa and smooth bromegrass of midwestern origin produced 10,028 pounds per acre; alfalfa and redtop produced 10,021 pounds; alfalfa and Kentucky bluegrass, 9,873 pounds; alfalfa and orchard grass, 9,003 pounds; alfalfa and timothy, 8,733 pounds. Mixtures were cut when the alfalfa was in the proper stage to be cut for hay.

Red-clover improvement (in cooperation with the U. S. Department of Agriculture).— Though northern anthracnose killed practically all leaves on southern clovers shortly before harvesting the first crop, few if any plants died because of it. Northern clover was only slightly affected by this disease. Minnesota clover produced 2,564 pounds of dry matter per acre from two cuttings of hay. Kentucky 101, Kentucky 140, and Kentucky 215 varieties produced 5,165, 5,246, and 5,236 pounds per acre, respectively. The Tennessee anthracnose-resistant variety produced 4,853 pounds per acre. Idaho clover produced 3,249 pounds per acre, and French clover 4,693 pounds. Midland, the variety synthesized by combining adapted central corn-belt varieties, produced 4,577 pounds, and Cumberland, a variety similarly produced from adapted southern varieties, produced 4,906 pounds. The average yield of the varieties blended to produce Cumberland was 4,937 pounds. Efforts to improve the Cumberland variety of red clover appear to be making satisfactory progress, as the field plots of the third generation of the improved variety produced 5,397 pounds of oven-dry hay per acre, 460 pounds more than the Cumberland variety produced.

Differences in yield of all clovers appeared to be caused principally by differences in height and vigor of growth. French, northern, and

northwestern clovers made no recovery after cutting the second crop of hay. Adapted clovers made good recovery. Alsike clover produced 2,680 pounds of oven-dry hay per acre, all from the first crop; no second crop was produced.

Castor beans.— Six varieties of castor beans were planted May 16 in a variety test conducted in cooperation with the United States Department of Agriculture. The yield per acre produced by each variety was: Conner, 1,280 pounds; Kentucky 38, 1,198 pounds; Kansas Common, 1,194 pounds; U. S. No. 4, 1,107 pounds; Doughty 11, 897 pounds, and U. S. No. 7, 969 pounds.

Seed formation in Kentucky bluegrass.— In 21 samples of seed heads taken at random from fields and curing ricks 46 percent of the florets contained no seeds, 26 percent contained shriveled seeds, and 28 percent contained well-developed seeds. Of matured florets from spaced plants, 76 percent of the florets from one of the plants contained hard seeds. It appears, therefore, that good seed-producing strains can be isolated. However, the first step toward improvement probably should be development of disease-resistant strains.

LIVESTOCK

Feeding, Management, Diseases

Bluegrass-molasses silage vs. *alfalfa-molasses silage as roughage for steers in drylot.*— Two similar lots of ten good to choice western Hereford yearling steers were fed for 126 days in drylot. Both lots received an average of 4.0 pounds of U. S. No. 2 first-cutting alfalfa hay and 13.7 pounds of U. S. No. 2 yellow shelled corn per steer per day. In addition, Lot 1 was fed daily an average of 14.6 pounds of alfalfa-molasses silage made from alfalfa cut when just coming into bloom, wilted until its dry-matter content reached about 30 percent, and ensiled with the addition of 46 pounds of blackstrap molasses per ton of forage. Lot 2 was fed daily, in addition to the shelled corn and alfalfa hay, an average of 13.3 pounds bluegrass-molasses silage made from full-bloom bluegrass, wilted, and ensiled with the addition of 44 pounds of blackstrap molasses per ton of forage. Lot 2 received a total of 6.6 percent more dry matter in its silage than Lot 1.

The steers that received alfalfa silage gained at the average rate of 2.41 pounds per steer per day, dressed 59.33 percent, graded "U. S. Good," and were valued at $13.65 per hundredweight. Those fed bluegrass silage made an average daily gain of 2.13 pounds per steer,

dressed 59.14 percent, graded "U. S. Good Minus" and were valued at $13.28 per hundredweight.

Distiller's corn dried grains and tankage vs. *cottonseed meal as protein supplements for steers in drylot.*— Twenty-eight choice yearling western Hereford steers averaging 868 pounds each were divided into two similar lots and fed for 140 days in drylot. Both lots received 15.1 pounds of corn silage and 11.64 pounds of U. S. No. 2 shelled corn per steer per day. Each steer in one lot also was fed 1.92 pounds of 41-percent-protein cottonseed meal daily while each in the second lot was fed 1.92 pounds of a mixture containing 2 parts distiller's corn dried grains and 1 part 60-percent-protein digester tankage. Wheat straw was offered in racks. Those fed cottonseed meal ate 2.33 pounds per steer per day, while those fed the mixed supplement ate 1.76 pounds.

The steers fed cottonseed meal gained 1.58 pounds per steer per day, dressed 59.01 percent, and graded "U. S. Good." Those fed the mixture of distiller's corn dried grains and tankage gained 1.52 pounds per steer per day, dressed 57.30 percent, and graded "U. S. Good minus." In a similar test in 1939, steers fed the mixed supplement gained 9.4 percent faster than the others, on slightly less feed.

Digestible nutrients in bluegrass-molasses, alfalfa-molasses, and corn silages.— Bluegrass-molasses silage made from full-bloom Kentucky bluegrass with 50 pounds of blackstrap molasses per ton, alfalfa-molasses silage made from quarter-bloom first-cutting alfalfa with 60 pounds of molasses, and normal corn silage were each fed to the same three 700-pound yearling Hereford feeder steers in consecutive digestion trials each consisting of a 5-day preliminary period and an 8-day collection period. Daily dry-matter intake was held at 10 pounds in all trials and no feed other than the silage being tested was given. The results showed that the bluegrass-molasses silage contained 11.7 percent digestible crude protein, 71.6 percent total digestible nutrients and had a nutritive ratio of 1:5.1; the alfalfa-molasses silage contained 11.7 percent digestible crude protein, 60.8 percent total digestible nutrients and had a nutritive ratio of 1:4.2; and the corn silage contained 5.6 percent digestible crude protein, 68.4 percent total digestible nutrients and had a nutritive ratio of 1:11.2, all percentages calculated on water-free feed. The coefficients of digestibility are, for crude protein, 0.705, 0.669, and 0.615; for ether extract, 0.652, 0.626, and 0.846; for crude fiber, 0.745, 0.468, and 0.577; for nitrogen-free extract, 0.629, 0.664, and 0.706; for ash,

0.511, 0.337, and 0.318, and for gross energy, 0.666, 0.588, and 0.637 respectively.

Pastures for hogs.— A feeding test compared the value of certain pastures for hogs self-fed corn, protein supplement (75 pounds tankage, 25 pounds soybean oilmeal) and mineral mixture (4 pounds ground limestone, 1 pound salt), free choice, during two periods, May 29 to July 3 and July 3 to August 28.

In the first period twenty 60-pound pigs were started on each pasture—one group on oats and rape grown together, another on bluegrass, and a third on alfalfa. Pigs on these pastures made the same daily gains this year (1.7 pounds) and as an average of four years (1.3 pounds). Feed requirements per 100 pounds gain, however, differed: 234.5, 250.2, and 243.1 pounds on the three pastures, respectively, this year; and 263.2, 272.7, and 255.2 pounds, respectively, as an average of four years.

In the second period, all pigs used during the first period were divided so that a representative half from each lot was transferred to an ungrazed alfalfa field and the other half to a field of lespedeza. Corn, protein supplement, and mineral mixture were self-fed free choice as in the first period. Average daily gains this year were 1.8 pounds on alfalfa pasture, 1.9 on lespedeza; for the four years, 1.6 on alfalfa, 1.7 on lespedeza. Feed requirements per 100 pounds gain this year were 347.2 pounds on alfalfa, 374.5 pounds on lespedeza; for the four years, 336.1 pounds on alfalfa and 348.3 on lespedeza.

Hybrid vs. *open-pollinated corn for hogs.*— Two very popular yellow hybrid corns, U.S. 13 and Ky. 102, proved quite satisfactory when shelled and self-fed to hogs in a feeding test, even though both were considerably harder than the Reid's yellow dent which was fed as a check. No significant differences in rates of gain or in amount of feed eaten per unit of gain were noted. In a separate palatability test with these varieties of corn the hogs at first ate Reid's yellow dent almost exclusively, but as the trial progressed, they ate increasingly large amounts of the two hybrids.

Effect of sanitation on survival and gains of pigs.— Under strict sanitation, for the last 3 years, an average of about 9 pigs were raised per litter, with an average weaning weight of 41 pounds at 62 days. The best results so far obtained are an average weaning weight of 50 pounds at 62 days. Raising them the healthy way saved 80 to 85 percent of the pigs, while under the old system where strict sanitary precautions were not followed, only about 35 percent of the pigs were

saved and the average weaning weight at 65 days was 30 pounds. Not only were these healthy pigs larger at weaning but they also continued to make greater and more economical average daily gains than the unhealthy pigs.

Alfalfa hay vs. *red-clover hay for pregnant ewes.*— Two lots of 10 bred western ewes each, housed in a barn with a paved outside runway and with access to salt, steamed bonemeal, and ground limestone were fed alfalfa hay and red-clover hay, respectively, at the rate of 5 pounds per ewe per day. The alfalfa hay graded U. S. No. 2+, averaging 74 percent color and 48 percent leafiness. The red-clover hay was also U. S. No. 2+ with 45 percent color, medium leafiness and good odor but rather stemmy. The ewes refused 13.3 percent of the alfalfa and 16.0 percent of the red clover. Lambs from the ewes fed the alfalfa hay were slightly larger at birth and at 28 days, and weighed 0.9 pound more at 56 days, than the lambs from the ewes fed red-clover hay. The ewes fed alfalfa hay sheared an average of 0.44 pounds more wool per ewe.

Bluegrass silage vs. *corn silage for pregnant ewes.*— Good quality corn silage, containing 33.8 percent dry matter, was fed at the rate of 10.4 pounds per ewe per day to ten pregnant crossbred western ewes, in drylot. Of this amount 27.3 percent was refused. These ewes received also 0.2 pound of soybean oilmeal per ewe per day. A similar group of ten ewes was fed an average of 11.6 pounds of bluegrass-molasses silage per ewe per day, of which they refused 11.9 percent. This silage was made from full-bloom Kentucky bluegrass with the addition of 80 pounds of blackstrap molasses per ton, and contained 30.0 percent of dry matter when fed. Salt, steamed bonemeal, and water were available at all times to both lots.

The ewes fed bluegrass silage maintained their weight slightly better than the others, and raised 1.1 lambs per ewe. At 56 days of age their single lambs weighed 28.5 pounds and their twins 21.7 pounds. The ewes fed corn silage raised only 0.8 lambs per ewe. Their single lambs weighed 26.4 pounds and their twin lambs 28.9 pounds at 56 days of age. The birth weight for the lambs in the corn-silage lot was 1.0 pound greater for the singles and 0.4 pound heavier for the twins.

Two similar groups of ewes fed, respectively, 5 pounds per ewe per day of U. S. No. 2 alfalfa hay and U. S. No. 2 red clover hay made better production records than either of the silage lots. A fifth group fed a half ration of corn silage and a half ration of alfalfa hay made the best record of any group.

Continuous vs. rotational grazing of bluegrass pasture for unweaned spring lambs.— Of seven tests that have been completed in this series, five have favored a system of rotation grazing in which ewes and their lambs are moved to a fresh third of their bluegrass pasture every two weeks as compared with similar lots of ewes and lambs grazing an equal acreage of bluegrass continuously. The average difference in lamb gains in favor of rotational grazing is 4 percent for the seven tests.

Creep-fed cracked corn for suckling lambs.— Suckling lambs fed to about four months of age on cracked yellow corn in a creep gained 17 percent faster on 20 percent more feed than comparable lambs creep-fed a mixture of 6 parts cracked yellow corn, 3 parts crushed oats, and 1 part linseed oilmeal. However, up to 100 days of age the lambs, especially the twins, made faster gains on the mixture than on corn. The final average market grades of the two lots were not significantly different. These results agree closely with those obtained in three previous tests.

Effect of docking and castrating young lambs, on subsequent gains.— Six pairs of male spring lambs, averaging 3 weeks old, were so selected that pair mates were closely comparable in breed, sex, age, birth weight, strength at birth, and daily gain up to the start of the test. All were weighed at the same time each day for eight days; then one lamb of each pair was docked and castrated. All lambs were then weighed for the next week. The lambs that were docked and castrated showed no lasting setback from the operation; in fact their average daily gain for the entire fifteen-day period was .401 compared with .387 for their pair mates that were not operated on. Similar results were obtained last year with twenty pairs of lambs.

Nodular infestation in late lambs.— Twelve late lambs taken off permanent bluegrass pasture on July 22 and fed in drylot for 112 days had no nodules on their intestines upon slaughter. Many nodules were on the intestines of a similar lot of lambs grazed on a bluegrass pasture during the same period. Somewhat fewer nodules were on the intestines of a third lot grazed on lespedeza for the 112-day period. Phenothiazine was administered to half the lambs of each group at monthly intervals in 15-gram doses. This treatment had no noticeable effect on nodule formation or on rate of gain.

Effect of shearing on growth and market quality of late lambs.— Thirty-six late lambs were separated into two closely comparable groups of 18 lambs each, one lot sheared on July 24 and the second lot was left unsheared. In all other respects the two groups received

the same treatment. When marketed, November 13, the sheared lambs had gained 22.4 percent more, dressed 1.92 percent more, and were worth $0.62 per hundredweight more than the lambs not sheared. They yielded an average of 2.53 pounds of wool each in July, which sold for $0.45 per pound, or $1.14 per fleece. All sheared lambs produced No. 1 shearling pelts.

Barn feeding vs. *lespedeza or bluegrass pasture for late lambs.* — Twelve late lambs full-fed U. S. No. 2 yellow shelled corn and U. S. No. 2 second-cutting alfalfa hay in drylot for 112 days (July 24 to November 13) ate 1.35 pounds of corn and 1.53 pounds of hay and gained 0.291 pound, per lamb per day. A similar lot grazed during the same time on a good Kentucky bluegrass and white clover pasture with no grain, gained 0.176 pound, and a third lot grazed on a Korean lespedeza pasture gained 0.162 pound per lamb per day. In the 70 days, July 24 to October 2, however, the gains were 0.307, 0.312, and 0.231 in the respective lots. The lambs on the lespedeza pasture made exceptionally good gains until the first killing frost (October 2) but unexpectedly poor gains from then on.

Incidence of sheep diseases.— During 1942 some 200 dead sheep from 155 flocks were brought to the Experiment Station for examination. A definite diagnosis of the cause of death was made in 149 flocks. Internal parasites accounted for 40 percent of the losses. Other causes were improper feeding, 20 percent; infectious diseases, 14 percent; respiratory troubles (largely due to improper housing and management), 13 percent; accidents and unusual conditions, 8 percent; and poisoning, 5 percent. From this it seems evident that bacterial diseases are not a serious cause of mortality in sheep. Parasites, improper feeding, poor housing, poor management, and poisoning (usually due to carelessness) accounted for 78 percent of the losses.

Coccidiosis in sheep.— There is very little definite information concerning the occurrence and importance of coccidiosis among farm sheep in the United States. In examinations at this Station in 1942 adult sheep with very few exceptions were carriers of coccidia. Four species of *Eimeria* were identified. Acute coccidiosis was diagnosed in the lambs in six different flocks. It appears that adult sheep are resistant to the disease; however, they are a source of infection for the lambs which are not resistant. Coccidiosis is a "concentration" disease; it increases with increase in number of animals and no increase in facilities for handling them.

Internal parasites of sheep.— All sheep examined during the year had internal parasites except lambs that were less than 2 weeks

old. Internal parasites were the major cause of death in 40 percent of the flocks examined. Sheep badly parasited become anemic, weak, lose flesh, and frequently develop diarrhea. Examination of animals that die shows all tissues to be flabby, pale in color, and edematous. An increased amount of fluid is usually present in the serous cavities. The cell volume is always below normal, sometimes as low as 5 percent. The principal micropathology is cellular degeneration, especially of the liver and kidneys. Phenothiazine appears to be the most effective remedy; however, it does not remove the lungworms, tapeworms, coccidia, or the nodules produced by the nodular worm. Mixture of copper sulfate and nicotine sulfate is fairly effective against tapeworms, but is not so effective as phenothiazine for removal of other internal parasites.

Virus abortion of mares.— In trials of tissue vaccine from the livers of infected fetuses, 82 mares in 5 bands were vaccinated early in the period of gestation. No cases of virus abortion occurred among these animals. The vaccine was also used in bands where the disease had made its appearance. Mares in two bands were vaccinated immediately after the disease appeared. In one no further abortions occurred; in the other, 5 additional cases of abortion occurred within 18 days following the third injection of vaccine. In a third band of 5 mares vaccinated four days after the first case of virus abortion, 4 of the vaccinated mares aborted within 90 days; the fifth produced a normal foal.

Salmonella abortivo-equinus vaccine widely used.— Sufficient vaccine to immunize 1,223 mares on 44 farms against *Salmonella abortivo-equinus* was prepared and distributed during 1942.

Incoordination (wobbles) of horses.— Eleven weanlings and yearlings affected with the disease were studied clinically, two being still under observation at the end of the year. Nine were killed and examined for gross pathological lesions. Portions of the spinal cord and cervical nerves were preserved and prepared for histopathological examination.

During 20 years not one case of wobbles has developed from contact exposure. Young normal horses kept in the same barn or in the same stall with animals having the disease in acute or in chronic form have remained well. There is no concrete evidence that the disease is hereditary; nor is there any consistency or regularity in occurrence of the disease on many horse-breeding farms in this immediate area. The disease is not accompanied by an initial temperature. The appetite of the animal is not affected; neither have

any of the affected animals manifested symptoms indicating brain involvement. Some cases develop slowly and remain mild in character for weeks or months; but in a small percent of cases the disease comes on suddenly and the animal rapidly develops extreme incoordination.

When the disease is viewed from every possible angle it resembles, in many respects that type of disease in man and animals that occurs more or less sporadically, and is the result of an infection, possibly a virus, that is transmitted by a special vector.

Periodic ophthalmia.— During six years neither young nor old horses in almost constant contact in stables, paddocks, and pastures, with horses having periodic ophthalmia have developed the disease. There are in the experimental group two four-year-old horses out of mares having the disease, sire normal; one three-year-old filly out of a mare and by a stallion having the disease; one weanling, sire normal, dam had the disease; one weanling, dam normal, sire blind with the disease. Not one of these offspring of diseased parents has thus far had the disease.

Genetic history of breeds of light horses.— Stakes-winning and poor-performing Thoroughbreds were compared with reference to inbreeding, the average relationship to each other, and the average relationship to selected ancestors. In each of these variables there were only minor ancestral differences, thus indicating the impracticability of paying serious attention to remote ancestors in the choice of breeding stock. The extent of unrecognized ancestry with reference to the General Stud Book (British) was found to be about 0.5 percent. This is a trifling matter, and yet it causes serious discrimination against American Thoroughbreds on the world market. The observed interval per generation among light horses was approximately 11 years, a value somewhat higher than that stated for horses in some standard sources.

Paratyphoid bacilli.— In the study of the occurrence and distribution of Salmonella, 1,055 cultures were identified. Of these 826 were isolated from domestic animals and 229 from man. Two, *S. berta* and *S. arechavaleta*, not previously found in the United States were recognized. *S. berta* previously was recognized only in hogs, but in this instance it was found in gastro-enteritis in man following the consumption of infected smoked sausage. A third instance of the occurrence of *S. pullorum* in mild enteritis of man was recorded. Three new Salmonella types were encountered and their antigenic formulae determined. These were *S. javiana* (IX:1, z_{27}-1, 5 . . .), *S.*

simsbury (I, III, XIX:z_{27}) and *S. tennessee* (VI, VII:z_{27}). The flagellar antigens of the latter two were not previously known.

Grazing of permanent pasture by dairy heifers.— As in five of the six preceding years, heifers on the alternately grazed plots gained more weight than those on the continuously grazed plot (366 and 348 pounds per acre, respectively).

Stimulation of milk secretion by diethylstilbesterol.— One half milliliter of a 1-percent suspension of diethylstilbesterol powder in cottonseed oil was applied twice weekly to the right half of the udder of E-527, a 16-month-old Jersey heifer, to ascertain whether such an application would cause lobule and duct proliferation. Plain cottonseed oil was similarly applied to the left half of the udder. E-527's udder was typical of any heifer of her age, there being no noticeable swelling. Within 14 days after the first treatment, however, the entire udder swelled and began to secrete milk. Violent oestrus followed nearly every application. The applications were continued for two months. A gradual increase in milk secretion was noted without a significant difference in gland development or milk secretion in either half of the udder. After six weeks of these applications, production leveled off at about 12 pounds of milk daily. The applications were then discontinued and the heifer bred. Conception was prompt (calf is due on April 2, 1943) and she is still milking (December 17, 1942), six months after the applications stopped.

Digestibility of Korean lespedeza hay.— Two digestion experiments were made using 5 cows (3 Jerseys and 2 Holsteins) and two lots of hay grown in Shelby county, on adjoining fields, cut just before bloom and when in full bloom. Both hays graded U. S. No. 1—green and leafy. Both were extremely palatable and during the 56 days of the two trials, all cows ate all the hay fed to them. The average daily consumption by the Jerseys was 21.7 pounds and by the Holsteins, 31.5 pounds per cow. The following are the results:

	Digestion coefficient		*Percent of digestible nutrients*	
	Before bloom	*After bloom*	*Before bloom*	*After bloom*
Crude protein	51	59	6.4	9.7
Ether extract	33	44	1.1	1.6
Crude fiber	53	51	17.8	15.1
Nitrogen-free extract	62	64	28.1	28.7
Crude ash	30	26	1.9	1.4
Total digestible nutrients	..	..	55.3	56.5

Abnormal bones of chickens.— Besides perosis, two types of abnormal bone development were observed in Kentucky for the first time about 1939. Type 1 was determined to be osteopetrosis, or

marble bone, which had been found in other states. Type 2 was cancerous or tumorous in character. These abnormalities to date have been observed in Kentucky in the ratio of 3 of the osteopetrosis type to one of the other. About 50 instances of these abnormal bones have been reported to the Experiment Station, evenly distributed geographically throughout the state. The blood of live birds affected was normal in both sexes. These abnormal bones are probably not caused by calcium limitation in the diet.

Comparison of fat in different parts of the body in laying pullets and hens.— Depot or reserve body fat located subcutaneously, intra-abdominally, and extending along the neck near the trachea and aesophagus, taken from laying pullets and yearling hens when sampled individually or as composite samples, have approximately the same iodine number, refractive index, and color for the two ages studied. The average iodine number of fat from the uropygeal glands was higher in the yearling hens than in the pullets, but the average refractive index was a little higher in the pullets than in the hens.

Spring bluegrass vs. *mature bluegrass as pasture for laying hens.*— The health and weight of hens receiving a complete all-mash ration were not influenced by a bluegrass range nor was the weight or hatchability of the eggs influenced, but the bluegrass pasture during the growing season increased egg production. Neither bare nor bluegrass range influenced feed consumption during the summer, after the grass had matured and partly lost its green color; but during the spring growing season the hens consumed less mash when given access to either a bare or bluegrass range than when confined. Less mash was consumed on the bluegrass plot than on the bare plot during this season.

When to stop turning turkey eggs during incubation.— If the eggs remained under incubation conditions until the 24th day, there was no significant difference in hatchability when turning was stopped on the 18th, 20th, 22nd, or 24th day. When eggs were transferred to the hatching compartment on the 21st and 24th days, and humidity was increased at that time there was a significant difference in favor of the later transfer. It appears that early transfer did not, in itself, affect hatchability but early transfer with increased humidity had an adverse effect.

Weight and hatchability of turkey eggs.— In an experiment with 8,064 fertile turkey eggs the average weight of which was slightly above 88 grams, those ranging from 75 to 99.5 grams had the highest hatchability. Considering this finding with those of other investi-

gators it appears that weight of the egg definitely affects hatchability, under the conditions of this experiment.

ORCHARD AND TRUCK CROPS

Peach resistance to cold.— Extensive bud counts after the 10°-below-zero weather of January showed a wide variation in resistance to cold among 67 varieties of 4-year-old trees that fruited this year. Some varieties showed the following fruit-bud survival percentages: Ambergem 92, Cumberland 85, Oriole 78, Othelle 75, Georgia Belle 75, Summercrest 73, Colora 73, Mamie Ross 68, Golden Jubilee 67, Viceroy 66, South Haven 65, Hardee 62, Raritan Rose 55, Veteran 55, Gold Aflame 47, Hiley 46, June Elberta 45, Triogem 44, Short 42, Halehaven 40, Sunbeam 39, Marigold 37, Fairs Beauty 36, Redelberta 35, Elberta 30, Frank 30, Vedette 28, Tena 27, Champion 26, Gage 12, Charlotte 3, and Barbara 2.

Boron deficiency in apples.— Abnormal internal corky spots and external corky and russeted areas on Yellow Transparent apples were identified as definite symptoms of boron deficiency. This condition was noted first in 1941 and was more serious on some trees in 1942.

The Harralson apple.— Among the newer varieties of apples under test, Harralson was outstanding. It is a late summer apple of good size and quality, bears young and heavily, and is promising for home use and local market.

Hormone spray against apple drop.— Apple trees of 4 varieties (Red Delicious, Stayman, Winesap, and Rome Beauty) were treated in September with a hormone spray (naphthalene acetic acid). No tree of any variety had so high a percentage of picked fruit on the trees not sprayed as on the sprayed trees. Drops on sprayed trees ranged from 1.5 to 8.9 percent, and on unsprayed trees from 3.8 to 35.3 percent.

Plums.— Of the plums set in spring of 1939, Bruce, Munson, and America bore their second full crop. French Damson, Blue Damson, Shropshire Damson, Early and regular Italian Prune varieties are slow to come into production, blooming only sparsely and producing only an occasional fruit this year.

Strawberries.— In tests with strawberries, yields 3 to 5 times the average for Kentucky have been obtained consistently. The practices followed to produce high yields were simple and practical, mainly good soil preparation and use of adapted varieties. Soil should be fertile, containing a considerable amount of organic matter and only

a moderate amount of available nitrogen. Treatments to get the desired soil condition depended on the soil to be used. Phosphate was used, if deficient; organic matter was provided by green-manure crops and barnyard manure, and available nitrogen was reduced by use of a cultivated crop the year preceding planting strawberries. The yellows-resistant strains of Blakemore showed greatest all-round adaptability and are replacing Aroma in the commercial areas. Catskill, outstanding during six years of tests, seems adapted to Central Kentucky for home use and local market, but is too soft for shipment and has not proved well adapted to Western Kentucky. Several new varieties under test are highly promising but their adaptability is not established.

Strawberry mulch.— Nine varieties of strawberries mulched with clean wheat straw in early December at rate of 2 tons per acre produced an average of 24 crates per acre more than spring-mulched plots. Berries not mulched were gritty and at least one grade lower in quality than mulched berries. In season, the non-mulched berries started ripening first but heaviest pickings for mulched and non-mulched plots occurred on same dates for both the Blakemore and Aroma varieties.

Fertilizing tomatoes and beans.— Plentiful phosphorus evidently is essential for a good set of fruit on tomatoes and beans. Fruit set was poor when nitrogen was abundant at bloom time, but liberal absorption at other times seemed to improve yields.

Copper needs of tomatoes and corn.— Tomato and corn plants require copper for satisfactory growth. In the absence of copper these plants become stunted and the leaves curled and necrotic. Early symptoms of copper deficiency resembled injury from severe drouth even though the plants were growing in water cultures. The yield of tomatoes was greatly reduced and only very small seedless fruits were produced. Corn plants did not develop tassels or ears when copper was excluded from the cultures. Enzyme activity in tomato fruits and leaves varied markedly with different copper treatments. In the leaves catalase and invertase attained their maximum activity with 0.01 ppm of copper in the culture medium, and peroxidase reached its highest development where copper was eliminated as carefully as possible. In the fruits peroxidase was affected very little by varying quantities of copper but invertase was greatly stimulated by increasing quantities of copper up to 0.05 ppm of the culture medium.

Method of applying nitrogen fertilizers.— Nitrogen fertilizers frequently are applied as a side dressing without being worked into the soil. This practice was found to be unsatisfactory because the fertilizer did not penetrate to the root area in rainless periods, and was lost by soil washing in heavy rains.

HOME ECONOMICS STUDIES

Effect of long standing on "drained weight" or firmness of canned fruits and asparagus.— Drained weight of rhubarb, strawberries, gooseberries, and raspberries canned without water was not definitely greater after they had been canned sixteen months. Raspberries canned with water increased in drained weight when 0.07 percent of calcium chloride was present. The increase was less after 16 months than after 7 months. At the end of 16 months drained weight was generally greater than at 7 months in gooseberries, rhubarb, and strawberries canned without water and in raspberries canned with water. Raspberries were canned in the same manner in 1942 as in 1941 except that they were kept in the oven at 275° F. for 40 minutes instead of 30 minutes. When the findings for all groups are considered, the presence or absence of sugar did not materially affect the drained weight.

Conversion of dehydroascorbic to l-ascorbic acid.— To find out whether the concentration of ascorbic acid was the same in the materials when they were treated with lead acetate, calcium carbonate, hydrogen sulfide, and carbon dioxide to remove interfering colors before titrating with sodium 2.6-dichlorobenzenonein-dophenol as when the acidulated extract was titrated directly with the dye, experiments with cabbage were carried out. Cabbage was used because its color does not interfere with the titration. Evidently the treatment to remove interfering color before titration also converts dehydroascorbic acid to l-ascorbic acid. As persons can utilize both forms, it is desirable in food analyses to show how much of both are present. Seventy percent of the ascorbic acid in cabbage was in the l- form and 30 percent in the dehydro form. The amount of ascorbic acid found in the fruits and asparagus, therefore, was probably the sum of the two forms.

When cabbage is boiled, half to three-fourths of the ascorbic acid is destroyed even though the cabbage is cooked only 7½ to 15 minutes after the water has begun to boil. Destruction of ascorbic acid in canning is not so great when the fruit or vegetable is partly covered with

water during cooking. After blanching, enough water was used to cover the cabbage in cooking. Twenty-four percent to 54 percent of the ascorbic acid was retained in the cooked cabbage, and 14 percent to 21 percent was found in the cooking water. By adding calcium chloride at concentration of 0.07 percent or less, 6.3 to 13.4 percent more ascorbic acid was retained in the cabbage, whether or not it was decolorized. The length of cooking time and the degree of ripeness and freshness affect the actual amount of ascorbic acid in cabbage, but the general trends remain the same.

FARM ORGANIZATION AND MARKETING

Farming adjustments to meet war needs.— From this study it was evident that the diversified agriculture in Kentucky provides a basis for balanced increases in production of meat and other livestock products, and of certain crops vital to the prosecution of the war. Of the crops, hemp for fiber and seed offers the greatest opportunity in direct war production, though soybeans for grain and tomatoes for canning should afford modest contributions. Expansion of production of dairy products, poultry products, pork and other meats offer much greater opportunity. Greater livestock production depends on production of more feed. Expansion of feed production is already under way and can soundly be increased by (1) greater use of barley, (2) more intensive cropping of level land, (3) increasing acreages of alfalfa and other hay, (4) using more winter cover crops for pasture and protection of the land, and (5) judicious use of commercial fertilizer and manure. Better feeding and management would likewise bring about an increase in livestock production.

Farm-to-market transportation.— Most of Kentucky's farm products are hauled to market in trucks; yet the number of trucks licensed in Kentucky declined steadily in 1942. From January 1 to July 1 the decline in both farm trucks and commercial trucks was about 10 percent, and the influences that caused the decline continued throughout the year.

The adequacy of trucking facilities for marketing farm products appears to depend on (1) the seasonal aspects of marketing—there being a much greater demand for transportation at certain times of the year than at others; (2) the location of trucks; and (3) the relation of number of farm trucks to number of commercial trucks. Some sections of the state are better supplied with trucks in relation to the quantity of products to be marketed, than other sections. In some areas, also, the proportion of commercial trucks to farm trucks is

higher and the total carrying capacity is larger, since commercial trucks are generally larger than farm trucks and better suited for farm-to-market transportation. The adequacy of transportation consequently varied from area to area, product to product, and season to season.

Transportation was nevertheless generally sufficient to market the larger production in 1942. Farmers were finding somewhat more difficulty in getting trucks, shipping costs were rising, and there was consequently less-than-usual freedom for timing sales and selecting markets.

Supply of farm labor.— Peak demands for labor in different parts of the state were found to vary according to the kind and amounts of crops grown, and the seriousness of the peaks to be influenced by dependence on hired labor. To help farmers substitute machinery for labor and get the most from farm power, farm accounts and records on farm power were examined, and equitable bases for custom rates were calculated for use of tractors and other larger farm equipment, or exchange of the use of these for the use of other equipment, labor, and teams. Labor-saving methods and devices were studied and recommended to farmers as a means of getting more work done with a given labor supply. Effects on labor peaks, of substituting one crop for another and shifting slightly the time of planting various crops, were examined and recommendations made. A study of various available sources of labor included the listing and analysis of jobs which may be done on short-handed commercial farms by women, boys and girls, town men, retired farmers, and small-farm operators not fully employed on their own farms. The extent to which help for farmers in commercial farming areas might be had from surplus-labor areas during peak labor periods was investigated.

Farming in a typical Outer Bluegrass county.— The rural land of Shelby county was mapped into six economic classes principally on the basis of use and productiveness of land, topography, soil type, and size and condition of buildings. Land Class I had no occupied farm dwellings and was practically abandoned for farming purposes. Of the total rural land in the county, 45 percent was in Land Class III, 23 percent in "Low III," 19 percent in IV, 9 percent in II, 3 percent in V, and 1.2 percent in I. Labor incomes for the farmers averaged $115 on Land Class II, $299 on Class "Low III," $484 on Class III, and $676 on Class IV. Proportion of acreage in different crops was about the same for all land classes except that a larger proportion of

tobacco was produced on Land Class "Low III" than on any other, and a larger proportion of hay (especially alfalfa) and grain was harvested on Land Classes III and IV. On farms on better land more dairy cows were milked per 100 acres than on farms on poorer land. Beef cattle and sheep were principally on Land Classes III and IV. More hogs per 100 acres were kept on the better land and more chickens on the poorer land. About three-fifths of the farm receipts were from dairy products and tobacco on all land classes.

For farms in the better land classes (III, IV, and V) the best farm organization was about 180 acres of land operated with crop and livestock enterprises requiring the work of 2 to 3 men. These farms had around 75 acres in harvested crops (including 5 acres of burley tobacco) and 20 to 30 dairy cows. Crop yields for the most successful farmers in Land Classes III and IV were 30 percent or more above the average for the county. These farmers spent $46 per 100 tillable acres for fertilizer and lime. On the best small farms, 56 percent of the productive-work units were used for tobacco, and on the best large farms 49 percent were used for dairying. It was evident that more of the farms on better land should sell fluid milk and should produce more alfalfa hay and more pasture. Many of the farms on the better land are too small for successful operation.

Farming in the Intermediate Bluegrass Region.— In this study the organization of typical limestone (Eden Shale) hill farms in Grant county was examined. Farm budgets were prepared for representative farms of the following sizes and types: (a) Small farms: tobacco-subsistence, tobacco-sheep, part-time or subsistence; (b) medium farms: tobacco-sheep, tobacco-subsistence, tobacco-dairy-sheep; (c) large farms: tobacco-sheep, tobacco-dairy-sheep, tobacco, tobacco-livestock. The adjustments evidently most needed are (1) smaller acreages of corn; (2) larger acreages of barley, hay (especially alfalfa) and pasture; (3) seeding of grasses with lespedeza; (4) more dairy cattle and sheep to use the greater production of hay, pasture, and grain. The shift to barley would require seeding most of the tobacco acreage to that crop. Yields of most crops would be increased profitably with a greater use of fertilizers.

Farming in the Lower Ohio River Valley area.— This study was based chiefly on several hundred detailed cost and business analysis records and land-use survey records, obtained in the area over a period of four years ending in March, 1942. The land was classified into three major classes, primarily according to topography and drainage. Of the entire area, the river overflow land was 13 per-

cent, the level to undulating land next to the overflow land was 35 percent, and the rolling to hilly land was about 52 percent. It was evident that two or more cropping plans per farm are desirable on most of the farms in the area, to fit the different classes of land. More feed grain is needed through growing barley, and growing more and better roughage, especially alfalfa hay. Pastures need to be improved by including sweet clover and lespedeza in the pasture mixture, and the pasture season needs to be lengthened by use of small grain and legume pastures in late fall and early spring. More and better use should be made of animal manure and green-manure crops. Most of the feed grains and roughage grown on the farm should be fed there in order to have the needed animal manure.

Farming in the Pennyroyal area.— Adjustments in farm organization shown to be economical in this area involve more emphasis on livestock production, and increasing the production of both concentrate and roughage feeds. The more significant conclusions reached in the study were: (1) Too many farmers crop their rolling land just as hard as their level land. In doing so they reduce their returns. Most of the level land in this area can stand a 2-year rotation if green-manure crops and enough fertilizer are used. Rolling land needs longer rotations. (2) More than one rotation is needed on most farms. (3) More feed could be produced per acre, without soil depletion, by better rotations including use of green manure and proper fertilizing. (4) Wider use of fall-seeded small grain for winter pasture and cover crop would reduce the amount of harvested feeds needed for livestock. Alfalfa is recognized as almost a necessity to the most profitable livestock farming. (5) Wheat as a harvested grain crop should, to a large extent, be replaced by barley.

Forest land use in the Eastern Highland Region.— Of 27,113 acres so far examined about 73 percent is forest land and 27 percent open land, including pasture, cropland, roads, streams, and so on. Yet, only about 20 percent of the total income from land is from forest products. Fire is the most serious cause of low production of the forests. In a complete tabulation of findings from 400 acres, 29.7 percent of the merchantable sawlog trees, and 39.2 percent of all trees had an open fire wound. Most stands are understocked because seedlings and young trees are completely destroyed by the fires that sweep through the forests annually.

Most of the present forest ownerships are either marginal sawtimber or cordwood stands. Though the volume of timber in the area is larger than most timbermen believe it to be, much of the

present volume represents inferior species and inferior trees for which no satisfactory market exists. Broken topography, relatively long distances to major market areas, poor transportation facilities, and an excessive proportion of inferior and low grade products combine to handicap production and marketing of forest products from this region. Timber is still considered a mine instead of a crop. There are no timber management plans for any of the private ownerships in the region and the marketing of stumpage is conducted without plan. Though the producers of sawmill products nearly all have 5 to 40 years experience in the business, not one was encountered who knew hardwood lumber grades and grading rules. This results in low-grade products that cannot be sold on the grade markets.

Grade-price relationships in burley tobacco.— Within each major group (flyings, lugs, leaf, and tips), prices decline from the better qualities of light color to the lower qualities of dark color, and the pattern is surprisingly uniform from year to year. Growers thus have an opportunity to increase their income by improving the quality of their tobacco. Differences in price, however, are not distributed uniformly between grades. For example, if a grower can handle his crop so that the flyings will grade X4F instead of X5F, he stands to gain about $10 per 100 pounds of that grade when the general market average is as high as $35. On the other hand, if he already produces fine tobacco but is able to increase its quality from X2F to X1F, he stands to gain only about $2 per hundred. Neither is the influence of color evenly distributed between grades. For the most part, color is more important as a price-making factor among the leaf and tip grades than among flyings and lugs, although green is particularly discriminated against in the latter two groups.

Seasonal trends in prices of dark fire-cured tobacco.— Prices usually fluctuate widely early in a marketing season, then settle down at about the season's average, and then decline in the closing weeks. The wide fluctuations in the opening weeks undoubtedly result from uncertainty as to size and quality of the crop. Small day-to-day variations in midseason usually reflect differences in quality of tobacco; and likewise the general decline in closing weeks is paralleled by a decline in quality.

Competition evidently is an important factor in seasonal price movements. Early in the season, buyers usually are fewest; commission dealer and company buyers are least active; and speculators and warehousemen are most active. Purchases by warehousemen support the market until the various buying agencies become more

active. Once the most of the buyers have entered the market, however, prices usually display considerable fluctuations only when influenced by heavy pressure from commission and dealer buying. Support of the market in the closing weeks often is weakened by withdrawal of some buyers, and by other buyers becoming sellers to dispose of undesirable purchases. Commission and dealer buyers take an increasing proportion of sales in the closing period, probably for speculation.

Federal-state strawberry inspection.— During the 1942 strawberry season 35 inspectors examined 1,036 carloads (or the equivalent thereof) of fresh strawberries, and 2,390 barrels of strawberries processed with sulfur dioxide. Because yields were among the highest on record, more inspectors were required. Also, for the first time, washed and sorted strawberries for processing were inspected, and inspectors for this service had to be trained.

Enforcement of the strawberry marketing and labeling act.— Compliance with the Marketing and Labeling Act was satisfactory in 1942. The cooperative associations at Paducah, Bowling Green, Oakland, Franklin, Russellville, Beaver Dam, Greenville, and Louisville, and private shippers at Mayfield and at Graham used the inspection service. Only one violation in labeling was encountered.

RURAL LIFE STUDIES

Effects of war on farm population in Eastern Kentucky.— Between April 1940 and December 1942 the estimated loss of people from farms in 33 counties was 85,000 persons, or slightly more than the total gain during the 10 years 1930 to 1940. Rates of decline were uneven within the region, and were lowest in the southeastern and south-central parts of the area. The rate of movement was continuing apparently without abatement at the close of 1942. Outmovement was largely of individuals leaving singly and maintaining their connection with family and kin. Many were heads of families who thus became temporarily separated from them. Practically all of the migration to December 1942 was to defense jobs in nonagricultural industries, principally in the Ohio Valley, Great Lakes, and Eastern cities. Though many of the migrants obtained skilled jobs, the majority were at semiskilled construction work or in service tasks requiring little technical training.

Farm population decline was greatest in the young-adult and middle-aged groups. The number of males aged 15-34 was 40 percent

smaller in December 1942 than in April 1940. Women of these ages, and particularly those 15-24, had also left in large numbers. In the resident population at the time of the survey, women 15-54 greatly outnumbered men of those ages. The number of elderly people changed but slightly, tending toward some increase. The number of children under 15 declined, but less than the number of men and women who provide the living of children and old people.

SUBSTATIONS

WESTERN SUBSTATION

Efficient use of limestone.— In liming experiments at the Princeton Substation liming rates lower than commonly used have been effective in increasing crop yields when reliming has been more often than common. Limestone (10-mesh and finer) at the rate of 1 ton per acre applied when the experiments were begun in 1927 and repeated 9 years later following three rounds of the 3-year rotation has increased the average crop yields for the 16 years practically the same as limestone applied at the rate of 2 tons per acre only at the beginning of the test. In the same experiment, applications of 1/3 ton of limestone per acre in the beginning and repeated in each succeeding 3-year rotation also produced average crop increases about the same as limestone applied at the 2-ton rate at the beginning. Results from applications at the 1/3 ton rate were most effective where limestone of medium fineness (40- to 50-mesh) was used.

Red-clover strains test.— Six red-clover strains seeded in 1941, in 3 replications each, had made medium stands. The average yields of the first cutting in 1942 in pounds per acre were: Kentucky 101, 3,189; Kentucky 140, 2,799; Illinois 6, 2,747; Kentucky 215, 2,712; Idaho 7, 2,369; and French F. C. 22563, 2,579.

Wheat variety test.— During the past two years two new varieties, Thorne and Ky. NS6, have produced slightly more wheat than the other kinds now in the test. In 1941 and 1942 six varieties were grown, each replicated several times. The average yield in these two years, of the varieties Thorne, Ky. NS6, Currell's Prolific, Kawvale, Fulcaster, Trumbull, and Nabob, ranged from 32 to 27 bushels per acre. Yield of the 7 varieties averaged 5.8 bushels per acre less in 1942 than in 1941.

Top-dressing pasture with phosphate.— In cooperation with the Tennessee Valley Authority triple superphosphate, 20-percent superphosphate, dicalcium phosphate, and tricalcium phosphate have

been applied in alternate years since 1934, on three experimental pastures, in amounts to supply 32 pounds of P_2O_5 per acre. Plots treated with 20-percent superphosphate produced in 1942 an average increase of 638 pounds of dry matter per acre over the yields from check plots; those treated with triple superphosphate, 638 pounds; those treated with dicalcium phosphate, 394 pounds; and those receiving tricalcium phosphate, 594 pounds. Untreated plots produced an average yield of 1,979 pounds per acre.

Pasture fertilizer experiment.— In this fourteenth consecutive year of this experiment steers on the unfertilized field gained 49.7 pounds per acre; those on the field treated with rock phosphate gained 133.8 pounds per acre; and those on the field treated with limestone and superphosphate gained 165.5 pounds per acre. As an average of the 14 years, average gains per steer per acre were: no treatment, 46.3 pounds; rock phosphate, 161.4 pounds; limestone and superphosphate, 161.7 pounds.

Egg production of pullets raised from pullet eggs.— In a comparison with Barred Rocks and White Leghorns there was practically no difference in average weight or average egg production of pullets raised from pullet eggs and of those raised from eggs of older hens.

Age of hens for breeders.— In a comparison of chickens hatched from eggs produced by pullets with those from eggs produced by hens, there has been practically no difference in the size and growth of the chicks in the two lots. The results show no significant, consistent difference in favor of using either old hens or young hens for breeders.

Apple variety and cover-crop tests.— For comparing cover-crop management, the 16-year-old orchard is divided into three plots, each plot containing some trees of each of four varieties. Plot 1 is cultivated each spring and fall and has a summer cover crop of soybeans and a winter cover crop of rye and vetch. Both cover crops are worked into the soil. Plot 2, originally in permanent sweet clover, is now in permanent lespedeza sod and the trees are mulched with cornstalks. Plot 3 is in permanent lespedeza sod without mulch. As the orchard is located on sloping land, soil erosion has been greater on the cultivated plot than on sod plots.

Until the past few years the trees of Plot 1 made the greatest growth and produced most fruit. In recent years, however, this plot has appeared less vigorous than the others, as shown by thinner and less thrifty foliage. This year it produced the lowest average yield of fruit. The sod plots were again superior to the cultivated plot in fruit size and finish.

Public meetings.— Because of war, labor shortage and transportation problems, the attendance at the public agricultural meetings, especially those held after the middle of the year, was lower than formerly.

ROBINSON SUBSTATION

General farming.— The season was unsatisfactory for farming in this part of the state because of excessive rainfall with floods in the low ground. About a third of the growing crop on the Substation farm was destroyed by high water. Ample hay was produced, and enough wheat, rye, and vetch for the fall seeding. Most of the corn gathered in this part of the state was of poor quality because of excessive rain.

Hybrid corn.— For three years a number of hybrid corns have been grown here to determine the best varieties for the mountains. This experience indicates that 69B and 72B are the best white, and U.S. 13 and 102 are the best yellow varieties.

Assistance to farmers.— Purebred seed corn was exchanged, bushel for bushel, for feed corn. Free service to the Duroc Jersey and Hampshire boars was given; Jersey bull calves, hogs, poultry, and eggs for hatching were sold at reasonable prices.

Meetings held.— The 4-H Boy's and Girl's Camp, July 27 to 31, was well attended; attendance at the Field Day, August 15, was only fair.

Sorghum.— In a variety test, Williams, an east Kentucky variety, produced 177.5 ten-pound pails of 80-percent sirup per acre. The second highest yield, 141.5 pails, was produced by a west Kentucky variety. Six other local varieties produced over 100 pails per acre. The lowest yield produced by a local variety was 69 pails. Yields produced by the four commercial varieties were 42.8, 28.5, 22, and 8.6 pails per acre. "Rust" was prevalent again and destroyed practically all leaves of three commercial varieties and of one local variety. Williams variety was the most resistant, but was injured enough to impart a slightly red color to the sirup. Yields from the fertilizer test in which the sorghum is grown in a 2-year rotation with hay, varied from an average of 72.8 pails of 80-percent sirup per acre from the untreated plots to 136.8 pails from the plot receiving a complete fertilizer.

Cafeteria feeding vs. *grain and mash for pullets.*— Two pens of 4-week-old Barred Rock pullets and one of Rhode Island Red pul-

lets were fed grain and mash, and an equal number were fed a cafeteria ration of yellow corn with 1 percent cod-liver oil, meat scrap with 2 percent salt, and soybean oilmeal, all in hoppers, and lespedeza hay in racks. The average number of eggs per pullet, for the laying year, was 159 for the Barred Rocks and 158 for the Rhode Island Reds, on grain and mash, while under cafeteria feeding the averages were 178 and 139, respectively.

ANALYSIS, INSPECTION, AND CONTROL SERVICES

Public Service Laboratories.— During the year a total of 36,840 specimens were examined, a decrease from last year of 2,861 specimens. This decline was caused by a general decline in public health activities resulting from health officers and public health nurses going into military service.

Of the total specimens, 34,232 were examined in the bacteriological laboratory. Of these 4,965 were for diphtheria; 5,133 for hemolytic streptococci; 1,926 stained smears prepared from specimens of sputa for tuberculosis; 315 blood specimens for typhoid and paratyphoids; 60 other specimens of blood for *Br. melitensis, Br. abortus,* tularemia, and Rocky Mountain fever. A total of 5,353 specimens from food handlers were examined for typhoid, paratyphoids, and dysentery; 5,978 specimens for gonorrhea; 2,410 specimens of feces for intestinal parasites; 347 heads for rabies examination. Bacteriological examination was made on 3,673 water samples during the year: on 2,473 samples of milk, 33 of cream, 19 of buttermilk, and 33 of chocolate milk. A total of 32 special investigations were made this year, most of them on samples of food from suspected poisoning or spoilage. During the year a total of 25,931 specimen containers were sterilized, assembled, and shipped out to County Health Departments for use in submitting specimens to these laboratories.

In the food laboratory 2,377 samples of various types of food products were examined: fruit and vegetables for spray residue, 14 samples; cornmeal for rodent excreta and insect contamination, 40 samples; hamburgers and sausage meat, 49 samples; carbonated and still beverages and fruit juices, 10 samples; canned spinach and kale suspected of containing glass, 19 samples; table salt for sand or glass, 2 samples; vinegars, 2 samples; miscellaneous samples, 3; and dairy products, 2,238 samples.

In the drug laboratory 231 samples were analyzed. Of these, only 93 were official food and drug samples collected by inspectors and submitted for analysis; 31 were semi-official samples of foods and soft

drinks submitted by county health departments. The Department of Game and Fish submitted 5 samples of river waters to determine whether streams were being polluted with distillery waste or waste from feeding animals with garbage or distillery slop.

Nursery Inspection.— During the year the nursery inspector traveled 19,840 miles to inspect stock and attend to the regulations governing its movement in Kentucky. During that time he made 94 regular inspections including 1,047 acres of nurseries and 21,400 square feet of sweetpotato plant beds.

Only one Japanese beetle was captured in the 800 traps in the Louisville area during 1942, and none was captured in Lexington. The beetle trapped in Louisville was several miles from the 35-acre area formerly infested and subsequently treated with lead arsenate.

In cooperation with the Bureau of Entomology and Plant Quarantine inspections of peach orchards in the state for phony peach disease have been made during the past seven years. No infected trees have been found for the past three years and it is believed that the state is now free of the trouble.

Black pine weevil was brought into the state in 1939 on balled Taxus plants, but prompt measures, including steam sterilization of the soil in the areas involved and the use of poisons, evidently eradicated this infestation. On careful inspection no further weevils have been found.

Phloem necrosis, a comparatively new virus disease of elms, was found for the first time in Kentucky nurseries this year. Since no effective treatment for this trouble has been discovered, all trees in the state found to be infected have been destroyed.

The European corn borer, for many years established in some of our border states, has appeared in numbers in Kentucky this year. A partial survey shows the insect to be present in Jefferson, Carroll, Boone, Kenton, and Campbell counties. Before this year less than a dozen worms have been found in the state.

Seed Inspection.— During the twelve months ending December 1, 1942, 6,506 samples of seed were tested. Purity separations were made on 4,148 and germination tests on 6,655. The samples received are classified as follows: Grasses, 1,091; clovers, 2,364; cereals, 1,041; large-seeded legumes, 244; hemp, 146; vegetables, 143; miscellaneous, 22; official (or collector's) 584; and tobacco, 911. Tobacco seed cleaned amounted to 2,683 pounds, in 911 lots. Judging by the samples received there appears to be a trend toward increased production of legumes, especially crimson clover, lespedeza, vetch, and soybeans.

The number of vegetable samples also showed a marked increase over former years. As a part of the hemp program, the Experiment Station contracted with the Commodity Credit Association to test for purity and germination some 8,500 samples of hemp seed.

Feed control.— During the year, 1,199 inspection samples of feed were analyzed chemically and microscopically and the results reported in detail to those concerned. An additional 446 determinations were made on miscellaneous samples for investigational work. As estimated from license tags issued, the farmers of Kentucky bought about 414,020 tons of commercial feeds, exclusive of whole and unmixed grains and hays. This is an increase in tonnage of about 30 percent over 1941.

The feed laboratory again collaborated with state and commercial chemists representing about seventy laboratories throughout the nation, on official methods of analysis. The joint project with the Department of Bacteriology on the microbiological determination of riboflavin in feeds was terminated. The work as associate referee on study of fat in cooked animal feeds containing cereals was continued, but with a reduced number of collaborators.

Fertilizer control.— During the year, 681 inspection samples and 29 farmers' and departmental samples were analyzed and the results reported in detail to those concerned. An additional 462 determinations were made of miscellaneous samples in investigational work. Twelve suits filed for prosecution because of misbranding resulted in a verdict of fine and cost in each. As estimated from the license tags issued, the farmers of Kentucky bought about 146,416 tons of fertilizer, an increase of about 20 percent over 1941.

The investigation on the method of determining acid-forming and base-forming quality of fertilizers was continued by the fertilizer laboratory as referee, eight chemists collaborating. The results, with recommendations, were reported to the Association of Official Agricultural Chemists.

A survey of the 1941 inspection samples of mixed fertilizer was made to determine their acid-forming and base-forming quality. About one-fifth, or 118, of these were analyzed by the A.O.A.C. method for this purpose. Most of the samples were acid forming. Some manufacturers, however, are making only non-acid-forming fertilizers for use in Kentucky.

A check was made on the activity of the water-insoluble nitrogen of the 1941 inspection samples. Samples having 0.5 percent or more

of water-insoluble nitrogen were analyzed by the official method for nitrogen activity. No inferior nitrogen carrier was found.

Creamery license section.— Licenses to buy milk or cream on butterfat basis issued and in force totaled 1,123, of which 1,093 were renewals and 30 were issued to establishments beginning operation after July 1. The total included 8 creameries, 16 cheese plants, 7 condenseries, 73 milk plants and ice cream manufacturers, 41 independent operators of cream stations, and 978 cream stations under contract to creameries. Authority to test for the period ending June 30, 1943, was issued to 1,219 operators using the Babcock test. These included 1,017 renewals, 118 licenses issued since July 1 after satisfactory examination, and 84 permits pending examination issued since July 1.

Examinations for applicants for license to test were held as follows: Bowling Green, 5; Lexington, 6; Louisville, 4; Mayfield, 4; Maysville, 1; Owensboro, 3; Princeton, 2; Somerset, 4; Walton, 3; special, 10. Of 610 applicants notified to appear for examination 301 appeared, 272 passed and 29 failed; of those failed 10 reappeared and 8 passed on the second examination.

During the year 819 inspections, including 18,426 tests, were made. Creamery operators were graded as follows: "A" and "B" (satisfactory), 414 operators; "C" (unsatisfactory), 264; "D" (probation), 133; and "E" (cited to appear before the Examining Board), 8. "Satisfactory" inspection certificates were issued to operators grading A or B.

Of 28,608 milk and cream test bottles, cream test weights, and milk pipettes received for calibration, 146 were rejected. Items of testing equipment in use, found on inspection to be inaccurate and therefore the cause of inaccurate tests were: 48 cream test weights, 7 test scales, 7 thermometers, 4 centrifuges, 7 platform scales, 3 dividers, 4 platform scale weights, 101 pieces illegal glassware, and 11 miscellaneous pieces of equipment. These were condemned and ordered to be replaced.

The Examining Board decided 14 cases as follows: 1 revoked license was reinstated; 2 testers were continued on probation subject to future inspections; 2 were removed from probation on satisfactory inspections; 2 no longer testing were removed from the minutes, and 6 licenses were revoked because of unsatisfactory testing and violation of rules and regulations. One application for reinstatement is pending. There were 4 testers on probation by the Examining Board at the beginning of the year and 2 at the close.

Receipts for the year were $10,255.55; and expenditures $8,255.90, as itemized:

Salaries	$5,004.96
Labor	620.99
Communication service	314.52
Freight and express	33.61
Sundry and laboratory supplies	169.15
Travel	1,884.89
Miscellaneous	65.78
Furniture and fixtures	162.00

INSECT CONTROL

The plant bug **Miris dolobratus** ***and its control.***— The plant bug *Miris dolobratus* was present on bluegrass in moderate numbers in the spring of 1942. Nymphs were found first on April 17 and adults on May 11. The insect was most numerous during the last week of May, had practically disappeared by June 10, and could not be found June 17. Males and females were nearly equal in number. Of the females, 77 percent were short-winged and 23 percent were long-winged. In one field, eggs were found in 62 percent of the stems of hairy chess, 26 percent of the stems of bluegrass, 9 percent of the stems of timothy, and 25 percent of the stems of orchard grass. The eggs were found in the stems of bluegrass at an average distance of 2.9 inches from the ground. Since the eggs remain over winter in the stems, clipping and removing the stems some time after the seed has been harvested, or rather heavy pasturing, would help to control this insect. Pasturing this season reduced the infestation.

White grubs.— A study was made of 13 species of white grubs belonging to genera other than the genus *Phyllophaga*. Included were *Popillia japonica* Newman (the Japanese beetle), *Anomala orientalis* Waterhouse (the oriental beetle), *A. binotata* Gyll., *A. flavipennis* Burm., *A. innuba* (Fab.), *A. kansana* Hayes and McC., *A. ludoviciana* Schffr., *A. minuta* Burm., *A. nigropicta* Casey, *Pachystethus lucicola* (Fab.), *Pachystethus marginata* (Fab.), *Pachystethus oblivia* (Horn) and *Strigoderma arboricola* (Fab.). The larvae of all these species were obtained by rearing or by exchange with workers in other states. The larvae of 6 of these species were unknown previously. Means were found for differentiating all the species and a key was constructed by which the injurious species can be readily identified.

Test of new nicotine insecticides.— A study was begun of nicotine copper benzoate, nicotine copper salicylate, nicotine copper thiocyanate, and nicotine zinc thiocyanate prepared by the federal Bureau of Agricultural Chemistry and Engineering. Laboratory tests

were made using each as a dust, diluted to 1-percent nicotine content with Pyrax ABB, a pyrophyllite. In replicated tests with first instar Colorado potato beetle larvae using untreated larvae on dusted foliage and dusted larvae on untreated foliage, the compounds at the dilution used were highly toxic and killed by contact. Further work is needed to determine whether or not the materials act as stomach poisons.

Codling-moth control.— There was a heavy carryover of codling-moth worms and a heavy flight of spring-brood moths in 1942. A spray program with lead arsenate and weak bordeaux, consisting of a calyx spray, 5 first-brood cover sprays, and 3 second-brood sprays, was used on both Experiment Station apple orchards at Lexington. One-half percent summer oil was added to the third to fifth, first-brood cover sprays. Notwithstanding the heavy infestation, this program resulted in the cleanest apple crop in years.

Oriental moth control with parasites.— From Henderson orchards, known to contain the important parasite *Macrocentrus ancylivorus* Roh., 2,922 twigs were collected and distributed in peach orchards, mainly in the Purchase section, where this parasite had been absent and the oriental moth was abundant.

Oriental moth parasites were reared from 1,277 infested peach twigs, collected in ten orchards, to ascertain the prevalence of parasites and the abundance and distribution of *Macrocentrus ancylivorus*. Parasitism was low, averaging 11 percent for the entire collection. *Macrocentrus ancylivorus* composed 55.7 percent of the total parasitism. Parasitism for one Henderson orchard was 51 percent. *Macrocentrus ancylivorus* was recovered for the first time from orchards in the Paducah section, a few specimens being reared from twigs from two orchards.

Methyl bromide fumigation for crown borer control.— A study was made to determine the minimum temperatures at which fumigation with 3 pounds of methyl bromide per 1,000 cubic feet of space for 2-hour or 4-hour periods could be depended upon to give complete mortality of strawberry crown borer eggs. No survival occurred with the 3-pound-2-hour dosage at chamber temperatures above 64° F. and load temperatures above 62° F. No eggs hatched following treatment with the 3-pound-4-hour dosage at chamber temperatures above 54° F. and load temperatures above 53° F.

To test the use of methyl bromide fumigation under field conditions, a 50-cubic-foot fumigator was operated for one week in the Louisville berry-growing area, starting March 16. In all, 84,075 dor-

mant Premier plants were fumigated with a dosage sufficient to destroy all stages of crown borer. Examination of patches containing these plants has shown no injurious effects from the treatment.

At the Princeton substation, yield records were obtained for Blakemore and Aroma strawberry plants fumigated in 1941. Blakemores receiving a treatment sufficient to kill crown borer outyielded untreated plants; Blakemores fumigated with a dosage heavy enough to kill the blossom buds were slightly outyielded by untreated plants. Aromas receiving a light treatment yielded the same as untreated Aromas. Aromas fumigated with a dosage which killed the blossom buds had their yield severely reduced.

Homemade bait for strawberry crown borer.— In other years good control of the strawberry crown borer was obtained with a commercial bait composed of apple refuse and sodium fluosilicate. This season, in replicated tests comparing the commercial bait with a homemade bait composed of dried apple pomace and lead arsenate, the commercial bait gave 75.4 percent kill while the homemade bait gave 89.2 percent kill of adult crown borers. The apple-lead-arsenate bait was prepared by drying fresh pomace left from cider making and coating it with 2.5 percent (by weight) lead arsenate.

Control of wireworm injury to tobacco plants.— Overwintering adults of the wireworm *Conoderus auritus* commenced laying eggs April 28, 1942, and were all dead by July 14. Two broods of larvae occur, one developing the same year the eggs are laid and one that lives over winter and completes growth the following year. None of the larvae in these tests lived through two winters. Adults from overwintering larvae appeared from July 25 to September 6, and did not lay eggs for another brood that year. Adults from eggs of the same year appeared August 10 to September 15, and did not lay eggs for another brood that year. Since most of the overwintering larvae do not pupate until midseason, tobacco cannot be transplanted late enough to escape injury by this brood. Early-planted crops, in general, will be less severely injured because as the season advances the number of worms in the soil gradually increases by the addition of larvae that hatch from eggs laid by overwintering adults.

Control of green June beetle larvae in tobacco beds.— Three poisoned baits were used in two series of tests of four replications each for controlling green June beetle grubs. One series of tests was made in April 1942 and one in August of the same year. These baits, which gave reasonably good control in earlier tests, were: (1) apple bait made of 96.5 pounds of apple refuse and 3.5 pounds of sodium

fluosilicate; (2) wheat-bran bait made of 25 pounds of bran and 1 pound of paris green; (3) cornmeal bait made of 25 pounds of meal and 1 pound of paris green. The apple bait was used dry at the rate of 10 pounds on 100 square yards of plant bed; the other baits were used at the rate of 6 pounds dry weight per 100 square yards, but they were moistened before being applied. In the spring tests, the apple bait gave a control of 69 percent; the bran bait, 62 percent; and meal bait, 67 percent. The apple bait in the late summer tests gave a control of 72 percent, the bran bait 72, and the meal bait 71. Differences in control were not significant. Since only about 80 percent of the grubs came to the surface to feed, the control by the three baits was good.

Poultry louse control.— Tests were made in the Station poultry houses comparing the effectiveness of nicotine sulfate roost paint and nicotine sulfate applied to the birds, when treatment was made during warm weather. At night, with temperature ranging from 67° to 82° F, both methods gave rather poor results. The roost paint in two houses gave 44.9 and 50.3 percent kill of the shaft lice while the body treatment in two houses gave 60.7 and 77.7 percent kill of the shaft lice. The poor results with the roost paint seemed due to the tendency of some birds to stand on the roosts on warm nights.

NEW PROJECTS — 1942

A study of the utilization of the forest resources of the Eastern Kentucky Highlands Region.

Transportation of farm and food products in Kentucky.

The influence of breeding and environment in the improvement of dairy cattle.

Factors affecting the milk production of purebred beef cows.

A study of the use of bacterial extract vaccines in the prevention and control of mastitis.

Control of the codling moth, plum curculio and oriental moth.

Investigation of nitrogen and phosphorus relationships in strawberries.

PUBLICATIONS

BULLETINS

420. Field tests of the relative effectiveness of different phosphate fertilizers. Geo. Roberts, J. F. Freeman, and Harold Miller. January, 1942.

421. Land-tenure classification and areas in Kentucky. John H. Bondurant and Wendell C. Binkley. January, 1942.

422. Growth of population in Kentucky 1860-1940. Howard W. Beers. April, 1942.

423. The effect of diminishing the proportions of starch in the feed of laying hens. G. Davis Buckner, W. M. Insko, Jr., and Amanda Harms. April, 1942.
424. Cooperative wool marketing in Kentucky. C. D. Phillips and C. M. Aull. May, 1942.
425. Life history of the wireworm *Aeolus mellillus* (Say). H. H. Jewett. June, 1942.
426. Equine virus abortion. W. W. Dimock, P. R. Edwards, and D. W. Bruner. June, 1942.
427. Seasonal prices of spring lambs on Kentucky auction markets. C. D. Phillips and R. W. Rudd. June, 1942.
428. Changes in land use and related changes in Knott County, Kentucky. R. H. Allen and Charles G. Deaton. June, 1942.
429. Trends in Kentucky agriculture, 1929-1939. David L. MacFarlane and Max M. Tharp. June, 1942.
430. Plant tissue tests as a guide to fertilizer treatment of tomatoes. E. M. Emmert. June, 1942.
431. Trends in demand for tobaccos of the Southern States. Bennett S. White, Jr. June, 1942.
432. Livestock movement at Kentucky auction markets. A. J. Brown and C. D. Phillips. June, 1942.
433. Marketing and pricing chickens in Kentucky. John B. Roberts. June, 1942.
434. Microorganisms of Group E of the genus Salmonella. D. W. Bruner and P. R. Edwards. September, 1942.
435. Late-cut vs. early-cut soybean hay as a feed for stocker cattle. E. S. Good. September, 1942.
436. Control of the corn earworm by clipping. E. M. Emmert and W. A. Price. November. 1942.
437. Tobacco diseases. Revised. W. D. Valleau. December, 1942.
438. Factors affecting hatchability of turkey eggs and livability of poults. W. M. Insko, Jr., Donald MacLaury, and A. T. Ringrose. December, 1942.
439. New uses for low grade tobacco. J. S. McHargue, C. W. Woodmansee, and Karl E. Rapp. December, 1942.
440. Composition of Kentucky bluegrass cut at different times during the year. G. D. Buckner, Amanda Harms, and W. M. Insko, Jr. December, 1942.

EXPERIMENT STATION CIRCULARS

53. How to make a thresher for castor beans. J. B. Kelley. November, 1942.
54. Serological identification of Salmonella cultures. P. R. Edwards and D. W. Bruner. December, 1942.

ANNUAL REPORT

Fifty-fourth annual report of the Experiment Station (for 1941). Thomas P. Cooper.

REGULATORY SERIES BULLETINS

30. Commercial fertilizers in Kentucky in 1941. J. D. Turner, H. R. Allen, and Lelah Gault. June, 1942.
31. Commercial feeds in Kentucky in 1941. J. D. Turner, Stacy B. Randle, W. G. Terrell, and J. J. Rose. July, 1942
32. Inspection, certification, and transportation of nursery stock in Kentucky with a brief report for the year ended June 30, 1942. W. A. Price and Howard G. Tilson. June, 1942.
33. Seed inspection in Kentucky, 1941-1942. W. A. Price, Mary L. Didlake, E. C. Vaughn, Encil Deen, Howard Tilson, Alice McDaniel, Katharine Fried, Margaret Morton, Mary Lee Littell, and Lucy Baugh. July, 1942.
9. Testing cream and milk for butterfat. J. D. Foster. Reprinted June, 1942.

EXPERIMENT STATION LEAFLET

Some facts concerning the feeding stuffs law of Kentucky and suggestions to the feeder and manufacturer. J. D. Turner. Reprinted August, 1942.

SCIENTIFIC PAPERS

In Agronomy

Advantages of the spectrophotometer to increase the accuracy of Deniges' method for determining phosphorus and arsenic. Martin E. Weeks. Trans. Ky. Acad. Sci. 9:81-88. 1942.

Association of tobacco leafspot bacteria with roots of crop plants. W. D. Valleau, E. M. Johnson, and Stephen Diachun. Science 96, (No. 2485):164. 1942.

Breeding tobacco for resistance to mosaic. W. D. Valleau. Jour. Bact. 43:272. 1942.

Changes that occur in some of the soluble nitrogen fractions of the burley tobacco leaf during the air curing process. J. R. Young and R. N. Jeffrey. Presented at annual meeting of Ky. Acad. Sci., April 10-11, 1942.

Control of the common mosaic disease of tobacco by breeding. W. D. Valleau. Phytopathology 32:1022-1025. 1942.

Dandelion control with dichloroethyl ether. W. C. Templeton and P. O. Ritcher. Amer. Soc. Agron. Jour. 34:283-284. 1942.

Entrance of non-motile bacteria and chemicals into water-soaked tobacco leaves. Stephen Diachun, W. D. Valleau, and E. M. Johnson. Presented at annual meeting of Ky. Acad. Sci., April 10-11, 1942. Also Abstr. J. Bact. 44:387-388, Sept. 1942.

Field strains of tobacco mosaic. E. M. Johnson and W. D. Valleau. Presented at annual meeting of Ky Acad. Sci., April 10-11, 1942.

Floret and seed types in Kentucky bluegrass in relation to yield and quality of seed. J. T. Spencer and E. N. Fergus. Amer. Soc. Agron. Jour. 34:1035-1041. 1942.

Isolation of *Bacterium angulatum* from overwintered tobacco field soil. Stephen Diachun, W. D. Valleau, and E. M. Johnson. Phytopathology 32:2-3. 1942.

Outbreak of Plantago virus in burley tobacco. W. D. Valleau and E. M. Johnson. Presented at annual meeting of Ky. Acad. Sci., April 10-11, 1942.

Relation between frogeye and greenspot of tobacco. Stephen Diachun, W. D. Valleau and E. M. Johnson. Trans. Ky. Acad. Sci. 9:90-92. 1942.

Relation of moisture to invasion of tobacco leaves by *Bacterium tabacum* and *Bacteria angulatum*. Stephen Diachun, W. D. Valleau, and E. M. Johnson. Phytopathology 32:379-387. 1942.

Semimicro determination of magnesium as the quinolate using the colorimetric ferric chloride method. Martin E. Weeks and Jack Todd. Presented at annual meeting of Ky. Acad. Sci., April 10-11, 1942.

Some experiments concerning the excretion of nitrogenous compounds from legume roots. Hugh G. Myers. Presented at annual meeting of Ky. Acad. Sci., April 10-11, 1942.

Virus nomenclature and classification. W. D. Valleau. Chron. Bot. 7:152-154. 1942.

White burley tobacco—what the engineer should know about its production. Lester S. O'Bannon. Mech. Engin. 64:187-192. 1942.

In Animal Husbandry and Dairying

Are pedigrees important? A comparison of stake winners and samples of beaten Thoroughbreds. Dewey G. Steele. The Blood-Horse 38:574-577. 1942.

Comparison of fats located in different places in the bodies of laying pullets and yearling hens. G. Davis Buckner, W. M. Insko, Jr., and Amanda Harms. Presented at annual meeting of Ky. Acad. Sci., April 10-11, 1942.

Concerning the relations of percentages of protein and fat in the "spare yolk" of eggs from hens fed different rations. G. Davis Buckner, W. M. Insko, Jr., and Amanda Harms. Presented at annual meeting of Ky. Acad. Sci., April 10-11, 1942.

Digestible nutrients in bluegrass-molasses, alfalfa-molasses and corn silages. Robert B. Hallmark and W. P. Garrigus. Jour. Anim. Sci. 1:354. 1942.

Genetic analysis of stakes winning and poor performing Thoroughbreds. Dewey G. Steele. Jour. Anim. Sci. 1:351. 1942.

Nutritional problems in the production of Thoroughbred horses. (abstract) L. J. Horlacher. Trans. Ky. Acad. Sci. 9:92-93. 1942.

Observations on the rate of growth of *Oospora bactis*. H. B. Morrison and H. W. Hill. Jour. Bact. 43:271. 1942.

"Slide rule" for determining time intervals. Donald MacLaury. Poultry Sci. 21:462-463. 1942.

Study of certain abnormal bones of chickens raised in Kentucky. G. Davis Buckner, W. M. Insko, Jr., and Amanda Harms. Presented at annual meeting of Ky. Acad. Sci., April 10-11, 1942.

In Animal Pathology

Ascorbic acid in equines. B. J. Errington, W. S. Hodgkiss, and E. P. Jayne. Amer. Jour. Vet. Res. 3:242-247. 1942.

Description of an unusual Salmonella type with special reference to the evolution of Salmonella species. P. R. Edwards and D. W. Bruner. Jour. Bact. 44:289-300. 1942.

Equine breeding hygiene. Proceedings forty-fifth annual meeting of the U. S. Livestock Sanitary Association. 1942.

Equine ophthalmology. B. J. Errington. Vet. Med. 37:16-25. Jan. 1942.

Equine twin placentation. B. J. Errington. Cornell Vet. 32:367-380. 1942.

Group of coliform bacilli serologically related to the genus Salmonella. C. A. Pelu! fo, P. R. Edwards, and D. W. Bruner. Jour. Infect. Dis. 70:185-192. 1942

Nutritional diseases of the equine. W. W. Dimock and B. J. Errington. North Amer. Vet. 23:152-157. 1942.

Periodic ophthalmia. W. W. Dimock and Bernard F. Trum (Capt. Vet. Corps). Army Vet. Bul. 36:199-209. 1942.

Serological variations in Salmonella. P. R. Edwards and D. W. Bruner. Presented at annual meeting of Ky. Acad. Sci., April 10-11, 1942.

Two new Salmonella types with related specific antigens. P. R. Edwards and D. W. Bruner. Jour. Immunol. 44:319-324. 1942.

Two new Salmonella types with undescribed flagellar antigens. D. W. Bruner and P. R. Edwards. Soc. Expt. Biol. and Med. Proc. 50:174-175. 1942.

In Chemistry

Absorption spectroscopy in chemical research. E. S. Hodge. Presented at annual meeting of Ky. Acad. Sci., April 10-11, 1942.

Active manganese in soils. G. Donald Sherman and W. S. Hodgkiss. Presented at annual meeting of Ky. Acad. Sci., April 10-11, 1942.

Amount of boron absorbed by soybean plants and its effect on their growth. W. S. Hodgkiss, R. H. Hageman, and J. S. McHargue. Plant Physiol. 17:652-660. 1942.

Determination of active manganese in soils. G. D. Sherman, J. S. McHargue, and W. S. Hodgkiss. Soil Sci. 54:253-257. 1942.

Effect of potassium iodide on the ascorbic acid content and growth of tomato plants. R. H. Hageman, E. S. Hodge, and J. S. McHargue. Plant. Physiol. 17:465-472. 1942.

Methods for the determination of copper and zinc in soil. G. D. Sherman and J. S. McHargue. Assoc. Off. Agr. Chem. Jour. 25:510-515. 1942.

Methods for the determination of moisture in tobacco. C. W. Woodmansee, Karl E. Rapp, and J. S. McHargue. Assoc. Off. Agr. Chem. Jour. 25:143-145. 1942. Also in Amer. Soc. Agron. Jour. 34:731-735. 1942.

Modification of the official method for the determination of nicotine in tobacco. K. E. Rapp, C. W. Woodmansee, and J. S. McHargue. Assoc. Off. Agr. Chem. Jour. 25:760. 1942.

Production of a lime-induced manganese deficiency on an eroded Kentucky soil. G. D. Sherman, J. S. McHargue, and W. S. Hodgkiss. Amer. Soc. Agron. Jour. 34:1076-1083. 1942.

Production of grey speck of oats in purified sand cultures. R. H. Hageman, J. S. McHargue, G. D. Sherman, and E. S. Hodge. Amer. Soc. Agron. Jour. 34: 731-735. 1942.

Report on boron and fluorine in soils. J. S. McHargue and W. S. Hodgkiss. Assoc. Off. Agr. Chem. Jour. 25:312. 1942.

Report on iodine and boron. R. H. Hageman, J. S. McHargue, and W. S. Hodgkiss. Assoc. Off. Agr. Chem. Jour. 25:552. 1942.

Spectrography in agricultural research. J. S. McHargue and E. S. Hodge. Assoc. Off. Agr. Chem. Jour. 25:510. 1942.

Use of corn gluten in iodine deficient diets (a preliminary report). W. S. Hodgkiss. Trans. Ky. Acad. Sci. 9:93. 1942.

In Entomology and Botany

Dandelion control with dichloroethyl ether. See entry under *Agronomy*.

White grub control with dichlorethyl ether. P. O. Ritcher and H. H. Jewett. Jour. Econ. Ent. 35: 441-445. 1942.

In Feed and Fertilizer Control

Report on acid- and base-forming quality of fertilizers. H. R. Allen. Assoc. Off. Agr. Chem. Jour. 25:345-348. 1942.

In Horticulture

Rapid method for estimating carbon contained in plant tissue extracts. E. M. Emmert and C. S. Waltman, Amer. Soc. Hort. Sci. Proc. 41:245-250. 1942.

Response of peaches in Kentucky to cultivation and cover crops and to sod cultures. A. J. Olney and W. D. Armstrong. Amer. Soc. Hort. Sci. Proc. 40:123-125. 1942.

Strawberry plant behavior as influenced by mulch. W. D. Armstrong. Amer. Soc. Hort. Sci. Proc. 40:367. 1942.

(Financial statement on pages 50 and 51)

FINANCIAL STATEMENT

Kentucky Agricultural Experiment Station in Account with the United States Appropriations, 1942

	Hatch	Adams	Purnell	Bankhead-Jones	Bankhead-Jones offset
Receipts					
From the Treasurer of the United States as per appropriations for fiscal year ending June 30, 1942	$15,000.00	$15,000.00	$60,000.00	$81,533.32	
Receipts from sources within the state as Bankhead-Jones offset					$81,533.32
Total	15,000.00	15,000.00	60,000.00	81,533.32	81,533.32
Expenditures					
Personal services	2,750.00				
Scientific, professional and technical services.	7,088.55	14,556.05	41,483.24	66,273.65	
Clerical, stenographic and similar services...	3,260.00		7,482.22	1,755.00	
Labor	64.00	62.50	3,279.24	3,801.26	
Stationery and office supplies	20.85	65.33	615.68	741.05	
Scientific supplies	180.78	271.77	273.44	4,773.03	
Feeds				875.23	
Other supplies	493.10		93.28	703.04	
Communication service			23.35	.60	
Postage			70.83		
Travel expenses	398.38		2,753.38	747.21	

	Hatch	Adams	Purnell	Bankhead-Jones	Bankhead-Jones offset
Transportation of things	.45	4.35	31.05	58.05	
Printing or duplicating	717.26		2,733.06	1,405.25	
Heat, light, water, power and fuel			379.81		
Contingent expenses	26.63	40.00		119.87	
Library			20.53	3.25	
Scientific equipment			585.89	237.22	
Machinery, trucks, tractors, tools, etc.			175.00	39.61	
Total Expenditures	$15,000.00	$15,000.00	$60,000.00	$81,533.32	

We, the undersigned, certify that the receipts and expenditures shown in this report from Federal funds and as offset to Bankhead-Jones funds are correct; that the expenditures were solely for the purposes set forth in the acts of Congress approved March 2, 1887 (Hatch), March 16, 1906 (Adams), February 24, 1925 (Purnell), May 16, 1928 (Hawaii), February 23, 1929 (Alaska), March 4, 1931 (Puerto Rico), June 29, 1935 (Bankhead-Jones Title I), June 20, 1936 (Alaska), and March 4, 1940 (Employer Contributions to Retirement); that the expenditures are in accordance with the terms of said acts so far as applicable to this station; and that properly approved vouchers are on file for all expenditures.

Signed:

THOMAS COOPER
Director of Experiment Station

FRANK D. PETERSON
Financial Officer of the Institution
Title Comptroller

1,500—6-43